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January 21, 2005

ORIGINAL

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Notice of *Ex Parte* Presentation
IB Docket No. 01-185
File No. SAT-MOD-20031118-00333
File No. SAT-AMD-20031118-00332
File No. SES-MOD-20031118-01879

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JAN 21 2005

Federal Communications Commission
Office of Secretary

Dear Ms. Dortch:

On January 18, 2005, Johnny Nemes of Inmarsat had a telephone conversation with Marcus Wolf of the International Bureau. Mr. Nemes's conversation focused on the fact that the Commission, in basing its ATC interference calculations on ARINC Characteristics, utilized the wrong technical information and thereby substantially understated the impact of ATC interference on Inmarsat aeronautical mobile satellite terminals. Specifically, Mr. Nemes explained that by using a value of -50 dBm, rather than the -72 dBm value provided in the relevant RTCA Minimum Operational Performance Standards (MOPS), RTCA DO-210D, the Commission understated the interference impact *by a factor of 158 times*. Mr. Nemes further explained that the relevance of the -72 dBm value is confirmed by the FAA's Technical Standard Order (TSO) C-132 for AMSS equipment, which refers exclusively to RTCA DO-210D as the relevant performance specification.

Enclosed is a copy of the FAA's TSO C-132, as well as a paper prepared by Inmarsat that provides a brief further explanation of the relevance of the RTCA MOPS and the FAA TSO in accurately calculating the impact of ATC interference on MSS.

Sincerely yours,

John P. Janka

cc: Richard Engelman
Marcus Wolf

No. of Copies rec'd 017
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Technical Standard Order

Subject: TSO-C132, Geosynchronous Orbit Aeronautical Mobile Satellite Services Aircraft Earth Station Equipment

1. **PURPOSE.** This Technical Standard Order (TSO) is for manufacturers of geosynchronous orbit Aeronautical Mobile Satellite Services (AMSS) Aircraft Earth Station (AES) equipment applying for a TSO authorization. In it, the Federal Aviation Administration (FAA) tells you what minimum performance standards (MPS) your AMSS AES equipment must meet for approval and identification with the applicable TSO marking.

2. **APPLICABILITY.** This TSO affects new applications submitted after this TSO's effective date.

3. **REQUIREMENTS.** New models of AMSS AES equipment identified and manufactured on or after the effective date of this TSO must meet the MPS in RTCA Document No. RTCA/DO-210D, "Minimum Operational Performance Standards (MOPS) for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics," Section 2.0, dated April 19, 2000 to include Change 1, dated December 14, 2000, and Change 2, dated November 28, 2001.

a. **Functionality.** This TSO's standards apply to AMSS AES equipment that provides direct worldwide communications between aircraft subnetworks and ground subnetworks using aeronautical mobile satellites and their ground earth stations. AMSS will support both data and voice communications between aircraft users and ground-based users, such as Air Route Traffic Control Centers (ARTCCs) and aircraft operators. Communication services with AMSS functions include four categories: Air Traffic Services (ATS), Aircraft Operational Control (AOC), Aeronautical Administrative Communications (AAC), and Aeronautical Passenger Communications (APC).

NOTE: We may have more airworthiness requirements for installing AMSS AES equipment intended for ATS communications. Contact your local geographic Aircraft Certification Office (ACO) for more information.

b. **Failure Condition Classification.** Failure of the function defined in paragraphs 3 and 3a of this TSO is a minor failure condition. You must develop the system to at least the design assurance level equal to this failure condition classification.

c. **Environmental Qualification.** Test the equipment according to RTCA Document No. DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 29, 1997 to include Change 1, dated December 14, 2000, Change 2, dated June 12, 2001, and Change 3, dated December 5, 2002.

d. **Software Qualification.** If the article includes a digital computer, develop the software according to RTCA Document No. RTCA/DO-178B, "Software Considerations in Airborne Systems and Equipment Certification," dated December 1, 1992.

e. **Deviations.** We have provisions for using alternate or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation under 14 CFR § 21.609.

4. **MARKING.**

a. Mark at least one major component permanently and legibly with all the information in 14 CFR § 21.607(d), except for:

(1) Section 21.607(d)(2). Use the name, type, and part number instead of the optional model number, and

(2) Section 21.607(d)(3). Use the date of manufacture instead of the optional serial number.

b. In addition, mark the following permanently and legibly with at least the name of the manufacturer, manufacturer's subassembly part number, and the TSO number:

(1) Each component that is easily removable (without hand tools),

(2) Each interchangeable element, and

(3) Each separate sub-assembly of the article that you determined may be interchangeable.

c. If the component includes a digital computer, then the part number must include hardware and software identification. Or, you can use a separate part number for hardware and software. Either way, you must include a means for showing the modification status.

NOTE: Similar software versions, approved to different software levels, must be differentiated by part number.

d. When applicable, identify the equipment as an incomplete system or that the appliance performs functions beyond those described in paragraphs 3 and 3a of this TSO.

5. **APPLICATION DATA REQUIREMENTS.** Under 14 CFR § 21.605(a)(2), you, as a manufacturer-applicant, must give the FAA's ACO manager responsible for your facilities, one copy each of the following technical data to support our design and production approval:

a. Operating instructions and equipment limitations, sufficient to describe the equipment's operational capability.

b. Installation procedures and limitations, sufficient to ensure that the AMSS AES equipment, when installed according to the installation procedures, still meets this TSO's requirements. The limitations must identify any unique aspects of the installation. Finally, the limitations must include a note with the following statement:

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or within a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements.

- c. When applicable, identify the appliance as an incomplete system or a multi-use system. Describe the functions that the appliance is intended to provide.
- d. Schematic drawings of the installation procedures.
- e. Wiring diagrams of the installation procedures.
- f. List of the components, by part number, that make up the AMSS AES system complying with the standards in this TSO. You should include vendor part number cross-references, when applicable.
- g. Instructions, covering periodic maintenance, calibration, and repair, for the continued airworthiness of installed AMSS AES equipment. Instructions should include recommended inspection intervals and service life.
- h. Material and process specifications list.
- i. The quality control system description required by 14 CFR §§ 21.605(a)(3) and 21.143(a), including functional test specifications. These test each production article to ensure compliance with this TSO.
- j. Manufacturer's TSO qualification test report.
- k. Nameplate drawing with the information required by paragraph 4 of this TSO.
- l. A list of all drawings and processes, including revision level, to define the article's design. For a minor change, you only need to make revisions to the drawing list available on request.
- m. An environmental qualifications form as described in RTCA/DO-160D for each component of the system.
- n. If the article includes a digital computer: a Plan for Software Aspects of Certification (PSAC); Software Configuration Index; and Software Accomplishment Summary. We recommend that you submit the PSAC early in the software development process. Early submittal allows us quickly to resolve issues, such as partitioning and determining software levels.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data to be furnished directly to the FAA, a manufacturer must have available for review (by the responsible ACO) the following technical data:

- a. The functional qualification specifications for qualifying each production article to ensure compliance with this TSO.
- b. Equipment calibration procedures.
- c. Corrective maintenance procedures within 12 months after TSO authorization.
- d. Schematic drawings.
- e. Wiring diagrams.
- f. Material and process specifications.
- g. The results of the environmental qualification tests conducted per RTCA/DO-160D.

7. FURNISHED DATA REQUIREMENTS. With each article manufactured under this TSO, provide the following:

(1) One copy of the technical data and information specified in paragraphs **5a(1)** through **(8)** of this TSO. Add any other data or information necessary for the proper installation, certification, and use, or for continued airworthiness, or for both, of the AMSS AES equipment.

(2) One copy of the data and information in paragraphs **5a(11)** through **(13)**, if the appliance performs functions beyond those described in paragraphs **3** and **3a** of this TSO. You must send these data to each person receiving one or more of the equipment for use.

8. HOW TO GET REFERENCED DOCUMENTS.


a. You can buy copies of RTCA Document Nos. DO-210D, DO-160D, and DO-178B, from RTCA, Inc., 1828 L Street, NW, Suite 805, Washington, DC 20036. Telephone (202) 833-9339, fax (202) 833-9434. You can also get copies through the RTCA website @ www.rtca.org.

b. You can buy copies of 14 CFR part 21, Subpart O, from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325. Telephone (202) 512-1800, fax (202) 512-2250. You can also get copies from the Government Printing Office (GPO), electronic CFR Internet website @ www.access.gpo.gov/ecfr/.

c. You can get FAA Advisory Circular (AC) 20-110 or the most current revision, "Index of Aviation Technical Standard Orders," and AC 20-115 or the most current revision, "Index of Articles Certified under the Technical Standard Order System," from the U.S. Department of Transportation, Utilization and Storage Section, M-443.2, Washington, DC 20590. Telephone (301) 322-4477, fax (301) 386-5394. You can also get copies from the FAA's Regulatory and Guidance Library (RGL) @ www.airweb.faa.gov/rgl. On the RGL webpage, select "Advisory Circulars."

Susan J. M. Cabler

Susan J. M. Cabler
Acting Manager, Aircraft Engineering Division
Aircraft Certification Service



Interference of ATC Into the Aeronautical Mobile Satellite Services (AMSS)

January 21, 2005

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Interference of ATC into Aeronautical Mobile Satellite Services (AMSS)

- In summary
 - Gross under-estimation of the impact of interference
 - FCC's ATC Order is plainly wrong because it is based on the wrong AMSS specifications
 - Interference impact is miscalculated by a factor of *158 times*
 - ATC Order plus proposed relaxations could impact the long term viability of AMSS

ATC Interference into AMSS

- Why?
 - FCC's ATC Order is based on interference calculations using data from the 'voluntary' ARINC Characteristics 741
 - RTCA DO-210D, Minimum Operational Performance Standards (MOPS) is the only 'mandatory' standard for AMSS and AMS(R)S services
 - FAA's Technical Standard Order (TSO) C-132 for AMSS equipment refers exclusively to RTCA DO-210D
 - As result, interference impact was miscalculated by a factor of *158 times*

AMSS Standards

- Background
 - The FCC and NTIA have misunderstood the role of the ARINC Characteristics
 - The word 'Characteristics' is there for a reason
 - It provides a voluntary set of guidelines for the form, fit and function of avionics
 - Fostering interoperability between products from different suppliers
 - Choice of compliance is a business decision for avionics manufacturers
 - Primary goal is to achieve interconnectivity of the avionics with aircraft pre-wired according to these Characteristics

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Interrelationship Between AMSS Standards

ICAO Standards and Recommended Practices, Annex 10 to the 'Chicago Convention'

**ICAO
SARPS**



**RTCA
MOPS
DO-210D**

US' AMSS standard developed to conform with ICAO SARPs

**ARINC
Characteristics
741**

Voluntary characteristics for form, fit and function for AMSS avionics. Primarily to foster avionics interoperability between different suppliers and to allow pre-wiring of aircraft

**Inmarsat
SDM**

Inmarsat mandatory requirements for AMSS equipment to receive approval for access to Inmarsat's Aeronautical Services

**FAA's
TSO C-132**

FAA's mandatory technical standard for AMSS equipment, which refers back to RTCA DO-210D for minimum performance requirements

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Purpose of AMSS Standards

- ICAO AMSS SARPs
 - International 'treaty' guidelines for global AMSS interoperability,
 - Specifies format of 'signal in space'
- RTCA AMSS MOPS
 - US national standard to comply with SARPs as promulgated by ICAO
 - Provides 'testable' minimum performance requirements as seen from the antenna port of the AMSS equipment
- FAA's AMSS TSO C-132
 - By referring to the RTCA MOPS, it provides the FAA's minimum requirements for the approval of AMSS avionics
- Inmarsat AMSS SDM
 - Provides complementary mandatory implementation specifications for mobiles and earth stations when using Inmarsat satellites
- ARINC Characteristics 741
 - Provides complementary voluntary guidelines regarding the form, fit and function of avionics
 - Allows pre-wiring of aircraft independent of choice of avionics supplier

Current ATC Order

- Uses non-mandatory ARINC Characteristic 741 to derive interference threshold of AMSS receivers
 - It derives a -50dBm interference threshold
 - It must be revised to account for the correct -72dBm requirement of the mandatory RTCA DO-210D specifications
 - This 22 dB difference results in over estimation of *158 times* of the interference threshold of current AMSS receivers
- Such over estimation invalidates interference calculations in the ATC Order

Use of AMSS over CONUS

- At any given time, hundreds of aircraft relying on AMSS to communicate whether on the ground or in the air
 - Over 70% fit of AMSS in US and foreign aircraft on long-hauls flights departing/arriving
 - High penetration of AMSS into the US government fleet of
 - 747s, 757s, Gulfstreams, C130s, C40s, P3s, etc. operating over CONUS and elsewhere
 - US' presidential fleet of aircraft also highly dependent on AMSS

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Interference of ATC into Aeronautical Mobile Satellite Services (AMSS)

- Conclusion
 - The error in the ATC Order, compounded by the proposed relaxations, will create a interference scenario for AMSS that cannot be disputed
 - The end result would be that AMSS will not be available at all times and at all phases of flights